



# Medium Frequency Transformer

Solutions for insulated high power density converters

*From the drawing board to a fully-tested medium frequency transformer prototype; optimise your converter design and validate your transformer's performance quickly and effectively.*

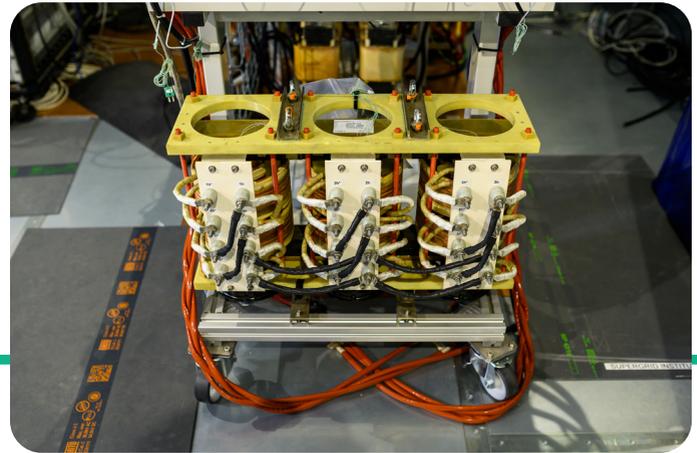
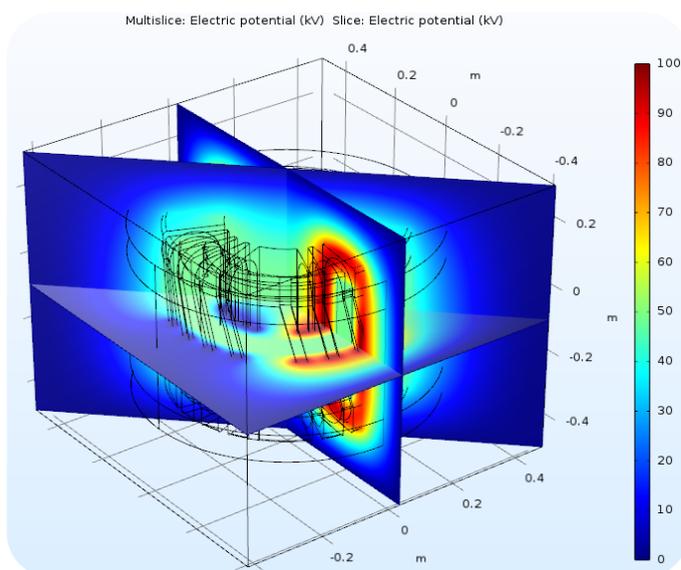
## OVERVIEW

SuperGrid Institute enables you to design, prototype and test the medium frequency transformer (MFT) required by your converter's application.

We optimise your MFT's performance and increase its power density using our in-house MFT design tools. Our innovative test bench allows you to perform stand-alone tests on your MFT, as though it was integrated within your converter.

Benefit from our expertise in medium voltage dielectrics for converters and our dry insulation prototyping capabilities. Gain a fully-tested and characterised MFT prototype, ready for industrialisation.

Our solutions cater primarily to the needs of the renewable energy, railway, smart grids and DC markets. We are also capable of addressing other markets' needs thanks to our diverse expertise.



## DESCRIPTION

We provide accurate, versatile in-house design services for the active parts of an MFT that are:

- suited to your converter's waveforms and geometry;
- able to provide size, weight, efficiency, losses and temperature specifications;
- based on rapid calculations: ~1M designs per minute enabling converter optimisation/comparison (challenging specifications possible);
- capable of providing accurate finite element modelling for critical parts of the design;
- able to generate equivalent electrical circuit components for integration into your converter simulation tools.

### Our MFT insulation expertise covers:

- Insulating material characterisation for your application.
- Dry or oil insulation solutions.
- In-house moulding and vacuum casting prototypes.
- Development of insulating materials specific to your needs.

### Our MFT test services include:

- Access to a dedicated test bench for standard transformer tests (no load, short circuit, full load) in medium frequency.
- MFT insulation tests.

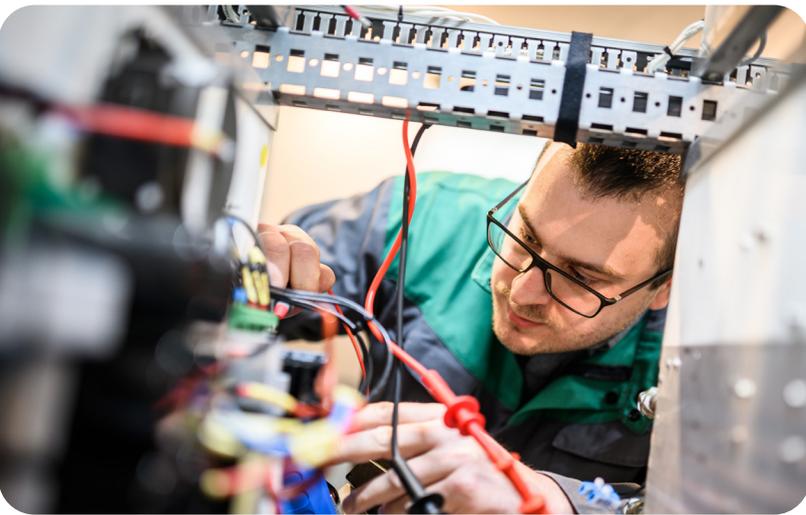
## AVAILABLE SERVICES

- Topology comparison through preliminary MFT designs
- MFT design
- MFT prototyping
- Characterisation and tests of inductive components
- Expertise on existing designs and troubleshooting
- Dielectric design of converters

# TECHNICAL FEATURES

## Software design tools' range & specifications

- From 20 kVA up to 10 MVA
- From 400 Hz up to 100 kHz
- Up to 100 kV insulation
- Possible combinations:
  - **Structure:**
    - Core Type / Shell Type / Toroidal
    - 1-phase & 3-phases
  - **Magnetic core:**
    - FeSi sheets, nanocrystalline and amorphous alloys, ferrite
  - **Conductors:**
    - Litz cable, Foils, Continuously Transposed Conductor (CTC)
  - **Insulation:**
    - Oil, dry, air
  - **Cooling:**
    - Forced and natural convection of oil and air, cold plates



- FEM and analytical scripts
  - Magnetostatic, magnetoharmonic and transient simulations
  - Thermal conduction
- Dielectric design
  - FEM-based design methodology adapted to superimposed voltages:
    - AC (Medium Frequency) + DC
    - AC (Medium Frequency) + AC (Low Frequency)
  - Complete dielectric designs
    - Primary/secondary, secondary/ground & primary/ground insulations
  - Connection and cable solutions
    - Techniques for electric stress grading and field smoothing

## CONTACT

For additional information or to ask for a quote, please contact:

[sales@supergrid-institute.com](mailto:sales@supergrid-institute.com)

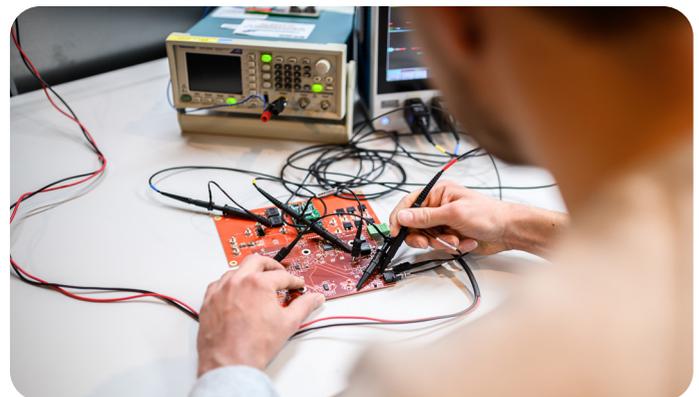


## Insulation solution specifications

- Air and dry insulation
- Dry insulation
  - Standard casting insulation
  - Advanced possibilities with APG and vacuum casting facilities
- Electrical connectors
- Oil insulation
- Possibility of adapting and developing new insulation materials (epoxy, silicones)

## Test means

- Magnetic Sub-assemblies characterisation:
  - Frequency range from DC up to 1 MHz
  - Induction levels, 1.2 T (static) - 0.8 T (40 kHz)
  - Sinus-Triangle-Trapeze / H or B control
  - Outputs, B(H) characteristics
  - Power losses measurement
- MFT characterisations:
  - Frequency range: 50 Hz - 100 kHz
  - No load test
    - 6 kV/10A sine & 8kV/10A square
  - Short-circuit test
    - 1kV/500Arms sine & square
  - Full load test:
    - back to back configuration
    - 6 kV/500Arms
  - Thermal measurements with FTIR camera and thermocouples
  - Acoustic noise level assessment



- High voltage test platform
  - Partial discharges with noise < 500fC - AC 50 Hz
  - Dielectric test up to 750 kV AC 50 Hz
  - Lightning impulse up to 2000 kV
  - Possibility of superimposing DC bias

March 2021  
© Lotfi Dakhlil - Photographie

## Shaping power transmission

SuperGrid Institute SAS - 23 rue Cyprian 69100 Villeurbanne, France  
+33 4 28 01 23 23 - [accueil@supergrid-institute.com](mailto:accueil@supergrid-institute.com) - [www.supergrid-institute.com](http://www.supergrid-institute.com)